**REMARKS**

The Office Action mailed 12 November 2008, has been received and its contents carefully noted. Claims 1-6, 11-18 and 20-29 were pending and rejected. Reconsideration in view of the following is respectfully requested.

**Rejection under 35 U.S.C. 103(a)**

The Examiner maintained the rejection of claims 1-6, 11-18 and 20-29 as being unpatentable over Zimmerman (US 5,849,176) in view of Reed (US 5,656,150).

Applicants respectfully submit that the present invention, as claimed, is directed to a process for reducing the coking on the metal walls of a heat exchanger which comprises pretreating the metal walls with a stream of steam comprising a mixture of a silicon compound and a sulfur compound (a Si + S mixture). Nowhere do the cited documents, alone or in combination, teach or suggest that pretreatment with (a) a Si + S mixture in (b) steam will reduce coking on the metal walls of a heat exchanger in a reactor for cracking hydrocarbons.

*Zimmermann disclosure is mischaracterized*

It appears that the Examiner's rejection is based on the premise that Zimmermann discloses that a Si + S mixture can be used in place of one compound containing Si and S (a Si/S compound). Applicants, however, respectfully submit that the Examiner does not fully appreciate the disclosure of Zimmermann. Specifically, the Examiner takes the excerpts of Zimmermann (e.g., col. 6, lines 53-57) out of context because in all the examples (1) the Si + S mixture was added only to the feedstock and, (2) in every instance where a Si + S mixture was added to the feedstock there was pretreatment of the metal with a Si/S compound. In other words, pretreatment of the metal with a Si/S compound ALWAYS preceded the use of a Si + S mixture.

It is important to note that even according to Zimmermann, the step of adding a Si/S compound or a Si + S mixture to the feedstock is not the same as the thermal pretreatment step of the test metal. Nowhere does Zimmermann teach or suggest replacing a Si/S compound with a Si + S mixture to treat the metal surfaces in the pretreatment step. At most Zimmermann suggests that the feedstock itself can be treated with a Si + S mixture instead of a Si/S compound.

Applicants also respectfully submit that "[i]t is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art". See Bausch & Lomb v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986).

As it appears that the Examiner improperly selected portions of Zimmermann and characterized those selected portions in a way that deceptively appears to support the rejection, the rejection under 35 U.S.C. 103(a) is improper and must be withdrawn.

*Adding a Si + S mixture to feedstock is worse*

Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to use a Si + S mixture in place of a Si/S compound in the pretreatment process. Again, Applicants point out that in all the experiments provided in Zimmermann where a Si + S mixture was added to the feedstock, the metal was always pretreated with a Si/S compound. Zimmermann suggested that instead of adding a Si/S compound to the feedstock, a Si + S mixture would be comparable as a feedstock additive. See col. 6, lines 53-56. However, based on the experimental data of Zimmermann, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to use a Si + S mixture in place of a Si/S compound in the pretreatment process (i.e. thermal pretreatment of the metal itself).

Specifically, all the metal samples featured in Table 1 of Zimmermann were pretreated with a Si/S compound, but the results show that a Si + S mixture added to the feedstock actually results in a decrease in inhibition of coke formation when compared with Figure 5 which provides the data of pretreatment of the metal with a Si/S compound alone (without the addition of a Si + S mixture to the feedstock). In fact, pretreatment of the metal with a Si/S compound alone resulted in "r" rates below 4 (see Figure 5), whereas pretreatment of the metal with a Si/S compound and then adding a Si + S mixture to the feedstock results in "r" rates above 4 (see Table 1, b), d)-f)). Thus, adding a Si + S mixture to the feedstock is worse as it decreases the effectiveness of pretreating the metal with a Si/S compound. Because adding a Si + S mixture to the feedstock decreases the effectiveness of pretreating the metal with a Si/S compound, treating a feedstock is not the same as pretreating a metal.

Nowhere does Zimmermann provide any example or data where a Si + S mixture was employed without prior pretreatment of the metal with a Si/S compound. Nowhere does Zimmermann provide any example or data where a Si + S mixture was used for thermal pretreatment of the metal. Thus, Zimmermann fails to teach or suggest that a Si + S mixture when added to a feedstock will inhibit coke formation in the absence of pretreating the metal with a Si/S compound. At most, Zimmermann shows that adding a Si/S compound or a Si + S mixture to a feedstock can prevent coke formation from rising after 35 hours. However, because Zimmermann does not provide any example or data where an Si + S mixture was employed without prior pretreatment with a Si/S compound, one or ordinary skill in the art would not have any logical reason to believe that pretreatment of the metal with a Si + S mixture instead of a Si/S compound (and with or without adding a Si/S compound or a Si + S mixture to the feedstock) will result in result inhibition of coke formation.

Consequently, it can not be said that one of ordinary skill in the art would have been motivated to use a Si + S mixture instead of a Si/S compound to pretreat the metal in order to provide inhibition that is the same or better than that obtained by pretreating the metal with an Si/S compound with a reasonable likelihood of success.

*Pretreatment with a Si/S compound and steam does NOT work*

It appears that the Examiner's reasoning for substituting hydrogen/methane gas with steam for the pretreatment process is based on the Examiner's assertion that steam is functionally equivalent to hydrogen/methane gas since Reed uses steam and such simple substitution will result in predictable results.

Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to substitute hydrogen/methane gas with steam for pretreating a metal since WO95/22588 (WO '588, U.S. Patent No. 5,922,192 (US '192)) teaches against using steam as steam is ineffective inhibiting coke formation. Specifically, in Example 6 of US '192, it is stated (emphasis added):

> The variation in the carrier gas used for pretreatment shows that steam is not suitable for long-lasting suppression of coking on materials pretreated with trimethylsilylmethyl mercaptan.

WO '588/US '192 teaches that a Si/S compound in steam "is not suitable" for inhibiting coke formation. Zimmermann shows that a Si/S compound in hydrogen/methane gas is effective. Clearly, because steam is not suitable but hydrogen/methane gas is effective, steam is not functionally equivalent to hydrogen/methane gas and can not be used as a simple substitute in the pretreatment process.

In addition, since WO '588/US '192 teaches away from using steam, one of ordinary skill in the art would not have been motivated to use steam in place of hydrogen/methane gas to pretreat the metal with a reasonable likelihood of success in inhibiting coke formation.

*WO95/22588 must be considered by the Examiner*

In the previous Office Action, the Examiner disregarded the arguments that WO '588 teaches away from using steam instead of hydrogen/methane gas in the pretreatment process because the Examiner stated that "[t]he Applicant's argument is moot because [WO '588] is not part of the rejection".

Applicants respectfully submit that this basis for disregarding the arguments and evidence related to WO '588 is entirely unsupported in law and fact. Specifically, there is no law or regulation which states that an applicant is restricted to rebutting a rejection with that which the Examiner used to formulate the rejection. There are numerous court and Board decisions where an invention is found unobvious because rebuttal evidence, which was not used in the examiner's rejection, submitted by an application teaches away from the invention. See e.g. In re Soni, 54 F.3d 746, 750 (Fed. Cir. 1995).

Moreover, WO '588 to the same inventors as Zimmermann (US 5,849,176) which is used as the basis for rejecting the instant claims. Thus, WO '588 is highly informative relative to the teachings set out in Zimmerman.

Therefore, the Examiner's disregard of WO '588 is legally improper. Since the Examiner has failed to rebut the fact that WO '588 teaches away from the instant invention, the claimed invention is unobvious.

*A Si + S mixture is not equivalent to a Si/S compound*

Since steam is not a simple substitute for hydrogen/methane gas which will yield predictable results, the Examiner's assertion that it would have been obvious to pre-treat the metal with a Si + S mixture in steam as (1) steam is a simple substitute for hydrogen/methane gas and (2) a Si + S mixture is a simple substitute for a Si/S compound.

As previously explained, steam is not a simple substitute for hydrogen/methane gas for pretreating a metal to inhibit coke formation. Thus, based on this fact alone, the claimed invention is unobvious.

Part of the Examiner's obviousness rejection appears to be based on the assertion that a Si + S mixture is functionally equivalent to a Si/S compound based on the disclosure of Zimmerman. Reed mentions nothing about use of a Si + S mixture. As previously explained, treating a feedstock with an additive is a completely different process from pretreating a metal. Nowhere, however, do the cited documents teach or suggest that a Si + S mixture is functionally equivalent to a Si/S compound for the pretreatment of metal in order to inhibit coke formation. Thus, Zimmermann and Reed do not teach or suggest that a Si + S mixture is a simple substitute for a Si/S compound for the pretreatment of a metal which will yield predictable results of inhibiting coke formation.

The fact that a Si + S mixture is not equivalent to a Si/S compound for the pretreatment of a metal is evidenced by WO95/22588 (WO '588, U.S. Patent No. 5,922,192 (US '192)) which shows that pretreatment of a metal with a Si/S compound in steam does not work. If a Si + S mixture were considered to be functionally equivalent and thus a simple substitute of a Si/S compound, the predicted result of using a Si + S mixture in steam by one of ordinary skill in the art would have been that the Si + S mixture in steam would not be suitable for pretreatment in order to inhibiting coke formation.

However, as provided in the instant specification, pretreatment of the metal with a Si + S mixture in steam unexpectedly works well. The fact that one works but the other does not work is clear evidence that a Si + S mixture is not equivalent to a Si/S compound for the pretreatment process. Clearly, a Si/S compound and a Si + S mixture are not simple substitutes for pretreating a metal to inhibit coke formation.

Since a Si/S compound and a Si + S mixture are not simple substitutes in the pretreatment process, one of ordinary skill in the art would not have been motivated to pretreat the metal with a Si + S mixture instead of a Si/S compound with a reasonable likelihood of success in inhibiting coke formation.

*Unexpected Results*

Despite the fact that a Si/S compound is not equivalent to a Si + S mixture and the prior art teaching away from the suitability of steam for pretreating metal in order to reduce coke formation, Applicants unexpectedly discovered that the use of steam, when used with a Si + S mixture instead of a Si/S compound, in the pretreatment of metal effectively inhibits coke formation. In fact, Applicants surprisingly found that a pretreatment with a Si + S mixture in steam significantly reduces the formation of coke on metal walls of reactors (e.g. inhibition rate ranges between 66% and 36% through 6 cracking/decoking cycles). See pg. 5 of the instant specification and Table 2.

Nowhere do the cited documents, alone or in combination, teach or suggest these surprising and significant results. Therefore, the claimed invention is novel and unobvious.

*Incorrect assertion that Zimmermann uses DMS for surface pretreatment*

The Examiner stated that Zimmermann discloses the use of dimethylsulfide (DMS) in the surface pretreatment.

This assertion is incorrect. Specifically, col. 2, lines 65-67 to col. 3, lines 1-3 reveals DMS is being discussed from the standpoint of inclusion in the feedstock before the cracking temperature is reached rather than pretreatment of the metal. This can be seen for example from the following disclosure contained in the paragraph immediately preceding the relied upon disclosure bridging columns 2 and 3 as follows (emphasis added):

> According to the invention, the process for producing thermally cracked products from hydrocarbons while simultaneously reducing the coke deposits on the heat exchange surfaces consists in adding to the feed to be cracked, before the cracking temperature is reached, 20 to 1000 ppm of an additive composition that is … [DMS]

Throughout Zimmermann, it is clear that an "additive composition" is one that is added to the feedstock rather than the pretreatment composition. Hence Zimmermann does not teach or

suggest the use of DMS in the pretreatment of the metal surfaces. As this incorrect assertion of how DMS is being utilized in Zimmerman represents a fundamental component of the obviousness rejection, it is respectfully submitted that a *prima facie* case of obviousness is lacking on the basis of this alone.

*Summary*

Since (1) treating a feedstock is not the same as pretreating the metal surfaces; (2) Zimmermann always pretreated the metal with a Si/S compound (when a Si + S mixture was added to the feedstock); (3) adding a Si + S mixture to a feedstock decreases the effectiveness of pretreating the metal with a Si/S compound; (4) a Si + S mixture is not a simple substitute for a Si/S compound in the pretreatment of metal; (5) the prior art teaches away from using steam and/or steam is not a simple substitute for hydrogen/methane gas; and
(6) Zimmermann does not teach or suggest to use a compound other than a Si/S compound to pretreat a metal, the present invention – pretreatment of the metal walls with a Si + S mixture in steam – is unobvious. Therefore, the rejection under 35 U.S.C. 103(a) should be withdrawn.

**Request for Interview**

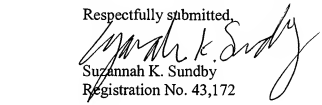
Either a telephonic or an in-person interview is respectfully requested should there be any remaining issues.

**CONCLUSION**

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Official action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefor are hereby authorized to be charged to **Deposit Account No. 024300**, Attorney Docket No. **033808.172**.

Respectfully submitted,



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